July 10, 2012

L-2012-270
10 CFR 50.73

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Re: St. Lucie Unit 2
Docket No. 50-389
Reportable Event: 2012-001
Date of Event: May 11, 2012

Unit 2 Trip due to Erratic Main Feedwater Regulating Valve Behavior

The attached Licensee Event Report 2012-001 is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

Very truly yours,

Joseph Jensen
Site Vice President
St. Lucie Plant

JJ/dlc
Attachment

JE22
NRR

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION
(10-2010)

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
St. Lucie Unit 2	05000389	1 OF 3

4. TITLE
Unit 2 Trip due to Erratic Main Feedwater Regulating Valve Behavior

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									NA	
5	11	2012	2012	- 001 -	00	07	10	2012	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE
1

10. POWER LEVEL
99%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Don Cecchett - Principal Engineer, Licensing	772-467-7155

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURE	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURE	REPORTABLE TO EPIX
B	SJ	FCV	F130	YES					

14. SUPPLEMENTAL REPORT EXPECTED
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On May 11, 2012 at 0355 EDT St. Lucie Unit 2 was at 99% power when an unplanned reactor scram occurred. Operators manually scrammed the reactor and turbine due to lowering of the 2A steam generator (SG) level caused by erratic behavior of the 2A SG main feedwater regulating valve (MFRV) FCV-9011. Unit 1 was operating at reduced power (29%) due to power ascension from the Extended Power Up-rate (EPU) refueling outage. The Unit 2 reactor trip was uncomplicated and all control rod assemblies (CEAs) fully inserted. In accordance with plant design, all three auxiliary feedwater (AFW) pumps started in response to an auxiliary feedwater actuation signal (AFAS) due to low SG level. No other automatic safety system actuations were required and none occurred. Reactor coolant system (RCS) heat removal was maintained with AFW and atmospheric dump valves (ADV). The Offsite power grid was available and stable.

The root cause for failure of the 2A SG MFRV was determined to be untimely corrective actions and sub-quality parts for the travel sensor (Xact) on the position feedback mechanism provided by the Vendor.

Corrective actions included procedure revisions and replacement of travel feedback sensors.

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NARRATIVE

Description of the Event

On May 11, 2012 at 0355 EDT St. Lucie Unit 2 was at 99% power when an unplanned reactor scram occurred. Operators manually scrammed the reactor and turbine due to decreasing 2A steam generator (SG) water level caused by erratic behavior of the 2A SG main feedwater regulating valve (MFRV) FCV-9011 [SJ]. The reactor trip was uncomplicated and all CEAs fully inserted. In accordance with plant design, all three auxiliary feedwater (AFW) pumps started in response to an auxiliary feedwater actuation signal (AFAS) due to low SG level. No other automatic safety system actuations were required and none occurred. Reactor coolant system (RCS) heat removal was maintained with AFW and ADV. The Offsite power grid was available and stable.

Cause

A root cause determined the failure of FCV-9011 was a result of untimely corrective actions and sub-quality parts for the travel sensor (Xact) on the position feedback transducer provided by the vendor.

Analysis of the Event

As a result of the un-timeliness of corrective actions, the Station missed an opportunity to take the actions necessary to correct the degrading transducer and prevent the reactor trip.

As demonstrated by this event and plant operating experience (OE), MFRV positioner and feedback designs, as provided by vendors, have been historically inadequate in that they have not been able to achieve predictable, long-term service commensurate with the vibration characteristics of the Main Feedwater (MFW) System. Operating life has varied from as long as an operating cycle to less than a week, depending upon the manufacturer and model of the device installed. The resistance film travel sensor transducer used in the Xact feedback device installed at the time of this event had an even shorter life cycle than its predecessors with a failure rate that was clearly increasing since the time of the installation of the first Xact design in 2007. The identified failure mechanism is damage to the resistance film caused by vibration of the position contacts against the film surface in the installed MFW location. This condition has been characterized by resonance frequency oscillations of the MFRV/turbine deck, causing contact wear of the resistance film of the travel sensor on the position feedback transducer. The resulting wear causes the feedback signal to be erratic and worsen as the degradation continues. In the absence of accurate position indication feedback to the positioner, proper MFRV control becomes impossible.

Modifications to the Unit 2 MFRVs have been implemented and include replacement of the MFRV resistance film feedback transducers with a Hall Effect magnetic non-contact position transmitter.

Safety Significance

As a result of decreasing water level in the 2A SG caused by erratic behavior of the MFRV, Unit 2 reactor and main turbine were manually tripped. Both trips occurred in accordance with plant design. All three AFW pumps, two motor-driven and one turbine-driven, started in response to an AFAS due to low SG level, also in accordance with plant design.

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NARRATIVE

All rods fully inserted, the control room operators entered the applicable Emergency Operating Procedure and responded appropriately to control feedwater to the steam generators, and the plant was stabilized in Mode 3. Based upon these considerations, there was no adverse effect on plant safety or on the health and safety of the public as a result of this event. Additionally, since all safety systems functioned in accordance with plant design, this event does not involve a safety system functional failure.

The conditional core damage probability (CCDP) conditional large early release probability (CLERP) values were evaluated for the stated event and were found to be below the thresholds required by RG 1.174 for the risk to be "Small". Therefore, it is concluded that the risk impact of the stated event is not risk-significant.

This event is reportable under 10 CFR 50.73(a)(2)(iv)(A) as any event or condition that resulted in a manual or automatic reactor trip and actuation of the AFW system.

Corrective Actions

The corrective actions listed below are entered into the site corrective action program. Any changes to the actions will be managed under the corrective action program.

1. Replace the resistance film travel transducers on both Units 1 and 2 Main Feedwater Regulating Valves with Hall Effect magnetic non-contact position transmitters. (Complete)

Similar Events

A review of industry operating experiences was performed. Several utilities had multiple failures and events as a result of vibration induced failures on Xact position feedback transducers for MFRVs. However these events were occurring concurrent with the time St. Lucie (PSL) was experiencing similar issues with the MFRV feedback transducers, but not the same design. Due to the timing of the events, it is unlikely PSL could have benefited from the OE.

Failed Component(s)

Manufacture: FISHERCONT **Model**: XACT-08-CS-N-20